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Briefing Paper

The causes of false fire alarms in buildings

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Executive Summary

The purpose of this project was to collate information about the causes of false alarms observed in buildings and to identify approaches that could be developed and used to reduce their occurrence.

Identifying contributors and obtaining false alarm data proved to be a difficult exercise, however, two different contributors were identified- Kings College London and Buckinghamshire & Milton Keynes Fire Authority.

Kings College London provided data from 699 false alarm incidents and following a thorough review of the data 6 physical interventions were identified to address all of the valid false alarms reported. Replacement of existing detectors with intelligent multi-sensor detectors (that detect more than one fire phenomena) was the solution that could reduce false alarms by the greatest amount (69%).

The data supplied provides a snapshot of the types of false alarms that are observed but is not a comprehensive account of what might be the most common causes in the UK.

Discussions with the Unwanted Fire Signals Officer of Buckinghamshire and Milton Keynes Fire Authority and analysis of their false alarm trends revealed that the use of a technical and experienced individual dedicated to investigating false alarms and engaging directly with regular offenders is a very effective means for Fire and Rescue Service Authorities to reduce false alarms.

Reducing the number of false alarms from domestic premises remains a challenge despite the fact that the vast majority are reportedly related to cooking incidents. Educating homeowners on effective installation and use of detectors in and around kitchens is likely to lead to the greatest reduction in false alarms from the domestic environment.

The Incident Recording System, used by Fire Officers to report on all callouts attended, lacks sufficient detail to accurately classify false alarm causes.

It has been identified that changes in standards or codes of practice are not necessary as the technology already exists and the codes provide adequate guidance. However educating building owners, responsible persons and the general public could contribute significantly to reducing false alarms as simple measures can often cause notable reductions. Also the increased use of multi-sensor detectors may avert false alarms from common causes such as cooking fumes, steam etc.

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Abbreviations

ARC	Alarm Receiving Centre
BMKFA	Buckinghamshire and Milton Keynes Fire Authority
CFOA	Chief Fire Officers Association
FDFAS	Fire Detection and Fire Alarm System
FIA	Fire Industry Association
FRS	Fire and Rescue Service
FRSD	Fire and Rescue Service Directorate
IRS	Incident Reporting System
KCL	Kings College London
LFB	London Fire Brigade
MCP	Manual Call Point
RP	Responsible Person
USHA	Universities Safety and Health Association
UWFS	Unwanted Fire Signal

1 Introduction

1.1 Object

The purpose of this project was to collate information about the common causes of false fire alarms observed in buildings and to identify approaches that could be developed and used to reduce their occurrence.

BRE has considerable expertise in the field of writing standards (for fire detection devices and fire alarm systems) as well as with testing and approvals of such devices and systems. This objective was to gather data for the types of false alarms that have been observed in the field and identify whether standards and codes of practice could be updated to reduce their occurrence.

1.2 Origin of request

The research project was undertaken for the BRE Trust (under contract reference 154-12-RM).

1.3 Client

BRE Trust

Bucknalls Lane

Watford

Herts

WD25 9XX

1.4 Contributors

Buckinghamshire Fire & Rescue Service

Brigade HQ

Stocklake

Aylesbury

Buckinghamshire

HP20 1BD

Health, Safety & Environmental Protection Office

King's College London

26-29 Drury Lane

London

WC2B 5RL

2 Description of the project

2.1 Overview

False alarms generated from remotely monitored fire detection and fire alarm systems cost businesses and Fire and Rescue Service (FRS) authorities an estimated £1 billion a year in the UK[1]. In the period 2011-2012 a total of 584,500 fire and false alarms were reported in Britain, 53.4% of these were not fires and therefore considered "False alarms"[2]. This is a considerable drain on FRS authorities as well as causing business disruptions leading to a loss of productivity and reducing the confidence of the general public.

A false alarm is a fire alarm signal resulting from a cause, or causes, other than a fire, in which a fire detection and alarm system has responded[3] such as:

- A fire-like phenomenon or environmental influence (e.g. smoke from a nearby bonfire)
- Accidental damage
- Inappropriate human action (e.g. malicious manual call point (MCP) activation)
- Equipment false alarms, in which the fire alarm has resulted from a fault in the system.

A false alarm becomes an unwanted fire signal (UWFS) when the FRS is requested to attend.

2.2 Methodology

The most direct way to identify the causes of false alarms would be to gather a large pool of relevant data from a number of sources including FRS's, collate them and identify solutions that have proven to be effective in the field. However identifying potential contributors and obtaining any data proved to be a very time consuming and ineffective exercise. This suggests that investigating false alarms and actively engaging with offenders to reduce them is not something that either FRS's or others do.

Through contact with CFOA, 20 or so FRS authorities were contacted on our behalf, although the relevant persons within those services did not respond. It can therefore only be assumed that they did not have the information that was required. A few FRS's responded to say this and pointed in the direction of data obtained from completed Incident Reporting System (IRS) reports produced by fire personnel that attend all callouts. Though this data provides some useful information, it did not help to identify the real causes (this is discussed in Section 4.3 and 4.4 of this report) of the call outs. Only one FRS (Buckinghamshire) authority was able to contribute useful information regarding UWFSs and this is detailed in Section 4 of this report.

Further data was obtained through Kings College London (hereafter referred to as KCL) as they have gathered the kind of data that was required for this research project. KCL has an estate comprising of 74 buildings directly managed by KCL including spaces such as lecture theatres, residential spaces, libraries, laboratories, teaching rooms, offices, restaurants and a chapel. These were built between 1830 and the present day and contain fire detection systems that were installed (or updated) at various intervals over the last 20 or so years. In total the premises of KCL cover a floor area of over 400,000 m^2 and, as with all premises this size, have experienced a number of false alarms over the years. The comprehensive data supplied by KCL from the last few years was reviewed and is detailed in Section 3 of this report.

3 Review of data supplied by Kings College London

3.1 Introduction

Since 2007 KCL's Senior Fire Safety Officer has instigated and led the adoption of a very proactive approach to the issue of false alarms; engaging on multiple levels to reduce their numbers. The strategies adopted include:

- effective incident reporting;
- follow-up investigations by suitably qualified personnel;
- control of contractors;
- procedural guidance;
- suitable internal responses.

This has led to a marked reduction in the number of activations over the years and the data (taken from references 4, 5, 6 and 7) is reproduced below:

Year	Academic Buildings Activations	Halls of Residence Activations	Total activations	Percentage change (year on year)	Cumulative % change (from 2009-2010)
2009-2010	148	135	283	-	-
2010-2011	147	131	278	-2%	-2%
2011-2012	151	84	235	-15%	-17%
2012-2013	148	38	186	-21%	-34%

TABLE 1: Summary of false alarm activations in KCL from 2009-2013

The recognised benefits to the College in continued reduction of unwanted fire alarms include:

- less business disruption meaning fewer interruptions to College activity (particularly research and student studies);
- less risk of enforcement action or implications on College insurance;
- less potential for complacency in not evacuating College buildings;
- less risk to life.

The reduction across the Halls of Residence is attributed to pro-active management of fire alarm provisions, systems improvements and occupant training that have had a greater effect than in academic buildings.

This section of the report reviews the data from false alarms by considering the general trends/observations and then investigating the specific causes of the false alarms and then proposing solutions.

3.2 Observations of period 2011-2012

To put the above data into perspective during the academic year 2011 – 2012 the College had 6 fire incidents (1 major and 5 minor) and 20 near miss fire incidents – 18 of which were caused by cooking and 2 of which were electrical[6]. In order to fall in line with the national reporting definitions for all UK Universities who report via USHA (Universities Safety and Health Association) the category of fire has been categorised into: fire major, fire minor & near miss fire incident. A near miss fire incident is classified as an incident involving only smoke, without flames, which may or may not cause damage. Minor and major fires are those that involve smoke, heat and flame with varying extent of damage (localised or multiple building fixtures and fittings). Many of the cooking incidents are now reported as near miss fire incidents rather than being deemed as 'fires'.

The single major incident was attributed to arson and the 26 activations from fire and near miss fire incidents account for 11% of the year's total callouts. The London Fire Brigade (LFB) attended on 113 of the 235 activations.

KCL have their own system to classify all alarm activations into appropriate categories and these are shown in the x-axis of Figure 1. The false alarm causes in the period 2011-12, starting with the highest, were: equipment faults, building works, steam, undetermined and cooking which accounted for 169 activations (71% of the total year).

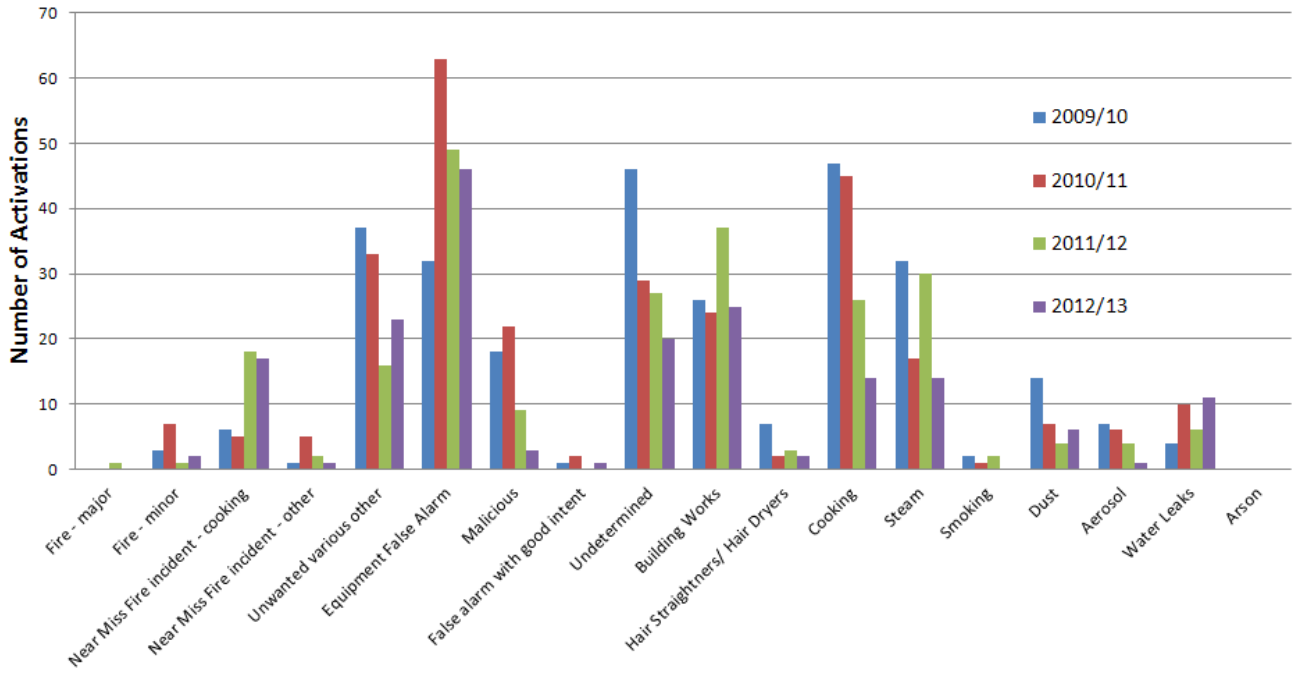

FIGURE 1: Alarm Activation causes in College Buildings 2009/10 - 2012/13

In 2011-2012 KCL's utilisation of pre-alarm within some of its premises resulted in averting 23 full building evacuations due to unwanted fire calls attributed to contractor works, burnt toast, equipment faults, etc. Due to the high attendance of London Fire Brigade (LFB) there is clearly significant room for the phased adoption of pre-alarm investigations to reduce the impact of unwanted fire calls across relevant college buildings.

3.3 Detailed review of period 2010-2013

KCL generate yearly internal reports detailing the following information: A log of all events leading to an alarm activation, time/date of event, campus, building, floor, location, zone, device, cause (generic heading), cause code (in more detail), whether or not LFB attended, more (detailed) information and the current status of each incident. A small example selection of this raw data is given in Table 2.

Cause	Cause Code (Breakdown)	LFB Attended	More Information
Unwanted	Building Works	no	KCL maintenance contractors testing chimney & smoke set off alarm
Undetermined	Undetermined	yes	KCL maintenance contractor checked detector but unable to establish a reason
Unwanted	Building Works	no	A contractor broke MCP by accident whilst removing rubbish
Unwanted	Unwanted various other	yes	Summer visitor mistakenly broke break glass whilst trying to open magnetic locked door
Unwanted	Near Miss Fire incident - cooking	yes	Cooking left unattended, oil in wok overheated producing large quantities of smoke
Unwanted	Cooking	no	Toaster in crèche kitchen
Unwanted	Building Works	yes	Dust from building works
Unwanted	Building Works	yes	Temporary lighting hung by a contractor below a heat detector
Undetermined	Undetermined	no	No sign of fire, alarm silenced & reset

TABLE 2: Selection of data from KCLs yearly internal reports 2012-13[7]

Whilst providing detailed information about the false alarms observed at KCL's premises further information detailing how each false alarm was addressed to prevent future re-occurrence was not available. Therefore the data supplied was reviewed and analysed to identify solutions that would potentially resolve the observed false alarm issue in the future.

In total 699 incidents were provided for review (from references 5, 6 and 7) and these covered all alarm activation events recorded in the period 2010-2013. Some of this data was excluded from further analysis for the following reasons:

- Fire major and fire minor were genuine alarms
- Ambiguous or too little information e.g. "A number of activations from this device"
- Data from which nothing could be inferred e.g. "No cause found" or "Not sure"
- No information reported in "More Information"
- Unresolved at the time "Under investigation"

After the above data had been filtered out, 432 events remained that were reviewed and summarised individually. Some of those events were common or similar and were therefore reported under the same cause. In total 110 activation categories were identified and the top 30 are summarised in Table 3 starting with those that had the highest frequency of occurrence and constitute 310 events (over 70%). The full list appears in columns 1 and 2 of the table in Appendix A.

Activation Category	Occurrence
MCP accidentally triggered	27
General dust from building works	25
Old detector	21
Burnt toast activating local smoke detector	20
Faulty detector head	19
MCP malicious activation	17
Unidentified equipment faults	17
Water leaks- corruption in loop	16
MCP mistaken for door release button	12
Smoke from cooking (hob)	11
Dust in smoke detector	10
Steam from shower	10
Maintenance of fire detection/suppression system	9
Panel fault caused alarm	9
Smoke from cooking oil	8
Cooking (microwave)	7
Overcooking	7
Suspected dust triggering smoke detector	7
Unattended food in microwave	7
Kettle triggering smoke detector	6
Hot tap left on triggering smoke detector	5
Nest of spiders/bugs in detector head	5
Smoke machine	5
Steam from kitchen appliance	5
Unattended food on hob	5
Burnt food activating corridor detector	4
Convection heaters cause activate heat detectors	4
Smoke from cooking (oven)	4
Steam from dish washer set off smoke detector	4
Water leaks- setting off detector or MCP	4

TABLE 3: Top 30 causes for unwanted fire alarm activations 2010-13

The challenge in reducing the data from 432 different events to 110 individual activation categories has been in grouping similar events together without loss of core information. At one extreme the information could be reduced too much to provide fewer categories with more frequency of occurrence or too much information could be supplied which would lead to more activation categories. The intention in the derivation of the above list has been to provide enough information, yet separate similar (but different) events. For example “Burnt toast activating local smoke detector” is one category and “Burnt toast activating local smoke detector, extraction not working” constitutes another.

In order to identify the most effective means to resolve each false alarm cause, the 110 activation categories were individually assessed for resolution through 6 physical interventions and these are reported fully in Appendix A. The solutions are summarised in Table 4 starting first with the one which would resolve the most. Each activation category can be addressed by more than one intervention solution e.g. “Burnt toast activating local smoke detector” can be resolved by both solutions 1 and 2 shown in Table 4.

Solution	Proposed intervention action	Number of potential causes resolved
1	Replace detector with multisensor	69.2%
2	Use of appropriate approved detector/s located correctly	43.5%
3	Use of protective covers over approved MCPs with adequate signage and CCTV where required	16.7%
4	Use of EN 54-2 approved analogue addressable panel	10.2%
5	Better control of contractors	9.7%
6	More rigorous maintenance of the system	6.0%

TABLE 4: Physical intervention actions for unwanted fire alarm activations 2010-13

There are a number of assumptions that have been made in generating the proposed interventions in Table 4 using the data in Appendix A. Most importantly there is the assumption that the proposed interventions would actually work in the field however as a first step they would be worth implementing. Also with limited information for some false alarm activations the proposed solutions may not work. The data does indicate the kinds of causes that are being observed in the field and offers solutions that may reduce false alarm more generally.

PHOTO 1: Manual Call Point fitted with a protective cover *(photo courtesy of Tyco Fire Protection Products)*

3.4 Discussion

KCL have adopted their own proven strategies for reducing false alarms such as:

- gathering reliable data and maintaining good data;
- communication of this data;
- the use of pre-alarm states during which an investigation is conducted;
- working closely with one fire alarm service provider. This ensures appropriate action is taken, effective maintenance is in place and a general proactive approach;
- greater control over and communication with contractors to isolate zones/devices during works. On occasions smoke detectors are changed for coloured heat detectors whilst construction work is in progress.

Recording the time and date as well as the location, zone and devices have provided valuable information in identifying trends and reducing false alarms. Sometimes it has only been because of this information that KCL have been able to identify the cause of reoccurring UWFS.

Getting a fully compliant BS 5839-1[9] fire alarm system designed, installed and commissioned has proven to be a challenge, so the College Fire Safety Officer and colleagues have worked hard to ensure that KCL does not accept poorly designed, installed and commissioned fire alarm systems during refurbishments and installation projects.

As well as significantly reducing false alarms at KCL this has led to a 44% reduction in UWFS's going through to LFB[1]. LFB is asking those in charge of the capital's buildings and businesses to:

- Ensure that someone within the building is responsible for the alarm and knows what to do when it goes off.
- Check that fire alarms are properly installed and are being properly managed and maintained.
- Investigate fire alarms before calling the Brigade out, where it is safe and practical to do so.
- False alarms are followed up and action is taken to prevent unnecessary further alarms.

From the review into the data supplied by KCL for the period 2010-2013 six key physical interventions have been identified that may reduce false alarms. A reduction of false alarms through other means such as use of processes, educating users etc. has not been considered for the data supplied from KCL mainly due to the lack of information and knowledge of the operational procedures at KCL.

From the review of the data supplied, the following solutions could be effective at reducing false alarms (in order starting with the one which would potentially resolve the most first):

- Replace detector with multisensor detector;
- Use of appropriate approved detector/s located correctly;
- Use of protective covers over approved MCPs with adequate signage and CCTV where required;
- Use of EN 54-2 approved analogue addressable panel;
- Better control of contractors;
- More rigorous maintenance of the system.

Of the solutions proposed, replacement with a multisensor is perhaps the most simple, direct and effective method. The use of appropriate approved detector/s located correctly is somewhat more complex as it involves a number of variables such as the type of detector being used, its sensitivity setting and its location considering local (potentially changing) false alarm sources. As an example, replacing an old detector with a new approved one may also require a change of location or sensitivity adjustment.

However replacing with an enhanced optical smoke and heat multisensor would most probably resolve the false alarm issue. Note that when more than one fire signature (such as heat and smoke) is present the enhancement algorithms within the multisensor can adjust the sensitivity levels generally making them more sensitive. There are few false alarm sources (as can be seen from the list in Appendix A) that produce both smoke and sufficient heat.

PHOTO 2: Optical/heat multisensor detector *(photo courtesy of Tyco Fire Protection Products)*

The cost for a standard optical smoke and heat multisensor are reported to be between £5 and £10 more than an optical smoke detector. Replacing a complete fire alarm system with multi-sensor detectors may be expensive (considering the overall cost of every new device and installation of it) but replacing problem detectors or detectors in those areas where there are more false alarm risks would certainly be cost effective. From the data quoted in section 2.1 of this report (£1 billion cost for 312,000 false alarms) the cost per false alarm works out at ~£3.2k to businesses and FRS's. Approximately £300 has been the estimate used for costs to FRS's associated with one callout[3] so the average cost to businesses is ~£2.9k per callout.

Multisensor detectors have the added advantages of providing greater confidence of a fire condition by detecting more than one fire signature and increasing sensitivity levels when more than one fire signature is present which ensures a quicker alarm response.

In order to quantify the effectiveness of the proposed solutions they would really need to be implemented in the field and monitored over a period of time.

4 Review of data supplied by BMKFA

4.1 Introduction

In order to investigate the common causes of UWFS's, senior persons at the Chief Fire Officers Association (CFOA) were contacted with a request to provide data to support this project. Of the 20 or so FRS's contacted by CFOA none of them were able to provide any data other than that resulting from completed IRS forms.

Malcolm Brightman from Buckinghamshire and Milton Keynes Fire Authority (BMKFA) was identified as a key person that could provide the kind of data required. Malcolm is one of the only Unwanted Fire Signals officer in the UK and his primary role is to investigate UWFSs by making contact with offending premises, to identify corrective actions to reduce further UWFS's and to provide guidance when required. As a result Malcolm has reduced the number of fire alarm signals by 45% over 7 years in Buckinghamshire and Milton Keynes. Raman Chagger (BRE Global) and Martin Duggan (FIA) jointly interviewed Malcolm and an overview of the findings are reported in Fire Magazine[3].

Malcolm reviews the data recorded in the IRS database generated by his colleagues to identify the worst offenders in relation to UWFSs. He then engages with four or five premises a week and a phone call or an email is often sufficient to identify and solve the problem. If not, then a site visit is arranged with the responsible person (RP) to identify the cause and propose solutions. The corrective measures that are implemented and their long term result are not recorded electronically so statistical data is not available to try and identify the frequency and type of successful interventions. However with the years of experience that Malcolm has (since 2006) his anecdotal accounts are key to providing valuable information that supports this research project.

The research was conducted by analysing the data generated from the IRS for BMKFA to see what information could be identified from the records. The common types of UWFS's that Malcolm has observed and reduced over the years were also reviewed and additionally methods implemented by building owners and users to reduce UWFS were also discussed.

4.2 Review of IRS data

In October 2007 the first version of the Incident Recording System (IRS) database was released. The DCLG's Fire and Rescue Service Directorate (FRSD) implemented a new web-enabled IRS with the intention to modernise the collection and subsequent statistical handling and publication of incident data from the Fire and Rescue Service (paraphrased from Incident Recording System – Questions and Lists Version 1.4[8]). The project was intended to provide the Fire and Rescue Services in the UK with a fully tested and piloted means of collecting, validating and transmitting data to DCLG on all incidents attended by the FRS.

4.3 IRS data and differences with BS 5839-1:2013

The causal factors used to categorise the UWFSs in the IRS are selected from lists of possible options which tend to lead those filling out the forms in a certain direction towards a limited generic description and can lead to a loss of accuracy in the reporting detail (see table 5).

LEVEL 1	LEVEL 2 - Type:	LEVEL 3 - Alarm activated by (sub type):	LEVEL 4 - Alarm activated by (category):	ID
Malicious False Alarm	By phone			10
Malicious False Alarm	By phone, Call **NOT** challenged			11
Malicious False Alarm	Special Service - Not Required			12
Fire alarm due to Apparatus	Human	Accidentally/carelessly set off		20
Fire alarm due to Apparatus	Human	Testing		21
Fire alarm due to Apparatus	Human	Smoking		22
Fire alarm due to Apparatus	Human	Cooking/burnt toast		23
Fire alarm due to Apparatus	System: smoke alarm	Poor maintenance		30
Fire alarm due to Apparatus	System: smoke alarm	Faulty		31
Fire alarm due to Apparatus	System: smoke alarm	Damaged		32
Fire alarm due to Apparatus	System: smoke alarm	Incorrect positioning		33
Fire alarm due to Apparatus	System: smoke alarm	Unsuitable equipment		34
Fire alarm due to Apparatus	System: sprinkler	Poor maintenance		40
Fire alarm due to Apparatus	System: sprinkler	Faulty		41
Fire alarm due to Apparatus	System: sprinkler	Damaged		42
Fire alarm due to Apparatus	System: sprinkler	Incorrect positioning		43
Fire alarm due to Apparatus	System: sprinkler	Unsuitable equipment		44
Fire alarm due to Apparatus	System: heat	Poor maintenance		50
Fire alarm due to Apparatus	System: heat	Faulty		51
Fire alarm due to Apparatus	System: heat	Damaged		52
Fire alarm due to Apparatus	System: heat	Incorrect positioning		53
Fire alarm due to Apparatus	System: heat	Unsuitable equipment		54
Fire alarm due to Apparatus	System: flame	Poor maintenance		60
Fire alarm due to Apparatus	System: flame	Faulty		61
Fire alarm due to Apparatus	System: flame	Damaged		62
Fire alarm due to Apparatus	System: flame	Incorrect positioning		63
Fire alarm due to Apparatus	System: flame	Unsuitable equipment		64
Fire alarm due to Apparatus	System: other	Poor maintenance		70
Fire alarm due to Apparatus	System: other	Faulty		71
Fire alarm due to Apparatus	System: other	Damaged		72
Fire alarm due to Apparatus	System: other	Incorrect positioning		73
Fire alarm due to Apparatus	System: other	Unsuitable equipment		74
Fire alarm due to Apparatus	Contaminants	Thrips		80
Fire alarm due to Apparatus	Contaminants	Steam		81
Fire alarm due to Apparatus	Contaminants	Chemicals/aerosols		82
Fire alarm due to Apparatus	Contaminants	Dust		83
Fire alarm due to Apparatus	Contaminants	Smoke Cloak		84
Fire alarm due to Apparatus	External factors	Power surge		90
Fire alarm due to Apparatus	External factors	Storm		91
Fire alarm due to Apparatus	External factors	water supplies -sprinklers only		92
Fire alarm due to Apparatus	Unknown			100
Good Intent false alarm	Fire	Smell of burning	Overheating light/fitting	110
Good Intent false alarm	Fire	Smell of burning	Overheating appliance	111
Good Intent false alarm	Fire	Smell of burning	Fire elsewhere (not at location)	112
Good Intent false alarm	Fire	Burnt toast/food	Toaster/toast	120
Good Intent false alarm	Fire	Burnt toast/food	Other cooking	121
Good Intent false alarm	Fire	Smoke/condensation	Controlled burning	130
Good Intent false alarm	Fire	Smoke/condensation	Air conditioning	131
Good Intent false alarm	Fire	Smoke/condensation	Steam	132
Good Intent false alarm	Fire	Smoke/condensation	Smoking chimney	133
Good Intent false alarm	Fire	Reflected light/sun-light		140
Good Intent false alarm	Fire	Other		141
Good Intent false alarm	Special Service - Not Required			150

TABLE 5: False Alarm Reason Types taken from Section 6.4 of the IRS[8]

If we consider the example of a local broken down smoke extraction system and as a result a nearby smoke detector activating due to cooking fumes, the cause might be recorded as Code 33: Smoke Alarm/ Incorrect Positioning. In actual fact the smoke alarm may be perfectly positioned considering other risks in the area. However, the fact that measures were in place but were temporarily un-operational would probably not be considered by the reporting Fire Officer. So there is a loss of information and potential misinterpretation in identifying false alarm causes. In the above example, there is no category that effectively describes it. As there is no appropriate ID for this particular case, if the Fire Officer was aware that the extraction was working, he might record it as a Code 34: Smoke Alarm/Unsuitable equipment which does not really describe it. However, even though the Fire Officer may have a self-consistent approach to categorising false alarms, this may not be consistent with his colleagues.

The categorisation of false alarms from the IRS database differs from those used in BS 5839-1:2013 (the Code of practice for design, installation, commissioning and maintenance of fire detection and fire alarm systems for buildings). In the IRS database, three high level categories are utilised:

- Fire alarm due to Apparatus;
- Malicious False Alarm Special Service;
- Good Intent false alarm.

In BS 5839-1:2013 (Clause 3.17) four categories used are:

- unwanted alarms, in which a system has responded, either as designed or as the technology may reasonably be expected to respond;
- equipment false alarms, in which the false alarm has resulted from a fault in the system;
- malicious false alarms, in which a person operates a manual call point or causes a fire detector to initiate a fire signal, whilst knowing that there is no fire;
- false alarms with good intent, in which a person operates a manual call point or otherwise initiates a fire signal in the belief that there is a fire, when no fire actually exists.

The fire warden or RP is expected to complete the record of the fire incident in accordance with the terms given in BS 5839-1 and this terminology differs from that used in the IRS database. It would be beneficial for all if these two methods were more closely aligned.

4.4 Review of BMKFA completed IRS forms

The top 25 causal factors for UWFSs (totalling 6612 independent events) from completed IRS entries for BMKFA from June 2009 to April 2013 are summarised below in decreasing order starting with the highest occurrence.

Causal Factors	Number (% of total)	Further explanation
Unknown	1351 (20.4%)	Undetermined cause
System: smoke alarm Faulty	893 (13.5%)	Faulty smoke alarm suspected but not validated
Human Accidentally/ carelessly set off	778 (11.8%)	This includes all MCPs, smoke detectors etc. accidentally set off by humans
Contaminants Dust	734 (11.1%)	Dust in detector but no details of what proportion from smoke, aspirating, beam etc.
Human Cooking/burnt toast	620 (9.4%)	This constitutes all events including misuse e.g. toaster used in office
System: other Faulty	615 (9.3%)	Faulty system- no detail of panel, device or cabling etc. is provided
Human Testing	270 (4.1%)	Somebody conducting weekly test of the system but not taking it off-line. Signal goes to ARC and FRS contacted
System: smoke alarm Incorrect positioning	217 (3.3%)	The positioning may well be in line with BS 5839-1 or the room usage may have changed
System: smoke alarm Poor maintenance	154 (2.3%)	No further details available: perhaps devices need replacing
Contaminants Steam	146 (2.2%)	No further details: steam from shower, kettle in office, dishwasher etc.
Contaminants Chemicals/ aerosols	106 (1.6%)	No further details of what proportion are chemicals and what portion are aerosols
Contaminants Minute animals	100 (1.5%)	Assumed to be in smoke detectors only
System: heat Faulty	95 (1.4%)	Cannot confirm this. Perhaps de-rating the heat detector could avoid this type of UWFS
System: other Poor maintenance	87 (1.3%)	No details on what this means and what it covers
System: smoke alarm Unsuitable equipment	63 (1.0%)	Meaningless without further details
System: other Incorrect positioning	62 (0.9%)	The positioning may well be in line with BS 5839-1 or the room usage may have changed
System: sprinkler Faulty	60 (0.9%)	A drop in water pressure from an activated sprinkler system causes a signal to be sent to the fire alarm system. Sometimes rogue signals are transmitted. Any general purpose input to the panel which activates the alarm can be susceptible.
External factors Power surge	55 (0.8%)	Fluctuations in power from the mains cause alarms to activate. Panel or detector not identified.
Human Smoking	55 (0.8%)	Cigarette smoke has triggered smoke detector
System: other Damaged	39 (0.6%)	Meaningless without further details
System: heat Incorrect positioning	32 (0.5%)	The positioning may well be in line with BS 5839-1
Contaminants Smoke Cloak	25 (0.4%)	Smoke cloaks used for security purposes are activated and set off the smoke detector.
External factors Storm	24 (0.4%)	Does not identify the cause- was it the panel or a detector?
System: other Unsuitable equipment	17 (0.3%)	Meaningless without further details
System: sprinkler Damaged	14 (0.2%)	For example a forklift truck hits the sprinkler head and this activates the fire alarm
TOTAL	**6612 (100%)**	

TABLE 6: UWFS record from BMKFA

As can be seen from the data it is very difficult to propose an intervention action (as done in Table 4 for the data from KCL) due to the lack of detail for the cause of each UWFS. As the causal factors are so generic, it would be ineffective to go through the exercise to identify the means that may reduce UWFSs.

It is possible that, depending on how the information was filled out, a person smoking could go under the category of “Human Smoking” or “Human Accidentally/carelessly set off”. Also a room that has changed usage and no longer has appropriate detection could go under the category of “System: smoke alarm Incorrect positioning” or “System: other Incorrect positioning” or “System: other Unsuitable equipment”. As the real cause is not identified consistently or accurately, this means that the recorded data is open to misinterpretation. The lack of appropriate technical training of persons completing the forms will tend to result in incorrect causes being attributed.

4.5 Background on Alarm Receiving Centres

There are many ways that a fire brigade callout can be made and as Malcolm has been dealing with reducing UWFS’s, it is worthwhile to review the processes involved in a callout. The most common way in which the brigade is alerted is when a premise is connected to an ARC and a false alarm occurs, the ARC is alerted automatically and a call to the FRS is subsequently made. An example of an ARC is shown in Figure 2.

FIGURE 2: Example of an ARC

In this example, the Fire Detection and Fire Alarm System (FDFAS) located in the premises generates an alarm signal. This is automatically sent through the monitored network resulting in a signal to the ARC and an operator located at the ARC calls the FRS. Weekly fire alarm tests are conducted by notifying the ARC of a test, just prior to it being performed and in this case no call is made to the FRS.

4.6 Summary of discussion with BMKFA

The following extract is taken from the BMKFA report[10] for the strategy for reducing UWFSs

"Our service currently attends all calls for assistance and does not attempt to delay/filter calls on the basis of number of previous UWFS or premises type. This approach provides a consistent safety message to industry and commerce and fosters an improved fire safety culture within premises based on education, guidance and where necessary, through enforcement, by use of the Regulatory Reform (Fire Safety) Order 2005. This is in direct contrast to the majority of other fire authorities who are seeking to reduce UWFS by selective non-attendance. The approach taken by BMKFA should reassure businesses that they will receive a prompt attendance, on every occasion that they summon our assistance. This policy will increase the overall resilience of the business infrastructure in the Milton Keynes area to fire and highlight the fact that we are actively making Buckinghamshire and Milton Keynes the safest place in which to travel, live and work."

This challenging ideal is achieved by BMKFA's unique approach to UWFS whereby one officer monitors all UWFS attended by the service. He is provided with detailed information about specific UWFS incidents that are fed to him by the officers and crews that attend the incidents. This enables Malcolm to make immediate contact with the RP at relevant premises. Often a phone call can avert further unwanted actuations of the alarm in the short term. Malcolm may follow this up with a visit to ensure that the UWFSs are reduced in the medium and long term. Malcolm bases all interventions on a protocol that improves the safety culture in the premises and ultimately makes the occupants safer from fire. Often the solutions for specific premises are bespoke but all are based on sound fire safety principles.

All Buckinghamshire fire crews are issued with a book of pre-printed reports (see Figure 3) which includes the address of the premises, name and contact number of person responsible for the alarm system which operated, date, incident number and stop code, as well as the name and contact number of the fire officer completing the form.

UNWANTED FIRE SIGNALS

FIRE AND RESCUE SERVICES ACT 2004
REGULATORY REFORM (FIRE SAFETY) ORDER 2005

UNWANTED FIRE SIGNALS PRESENT AN UNNECESSARY BURDEN TO FIRE SERVICE RESOURCES. IN ADDITION TO THE INCREASED BURDEN ON THE COMMUNITY, OTHER CALLERS MAY BE PUT AT INCREASED RISK WHILST ALTERNATE RESOURCES HAVE TO TRAVEL FURTHER TO REACH THEM.

Address of Premises: .....

.....

.....

Name: (CAPITALS) .....
(Name of person responsible for the alarm system which operated)

Contact Number: .....
(Telephone number of the person responsible)

Date: ..... **Incident No:** ..... **Stop Code:** .....

Buckinghamshire Fire and Rescue Service has attended the above address in response to the operation of an Automatic Fire Alarm and as no fire has been found, the incident is being recorded as an Unwanted Fire Signal.

Alarm caused by:- (tick box)

(a) Dust, Thrips	☐	System reset before arrival	☐
(b) Defective System	☐	Fumes from cooking or other process	☐
(c) Unsuitable equipment location	☐	Unable to establish cause	☐
(d) Other	☐		

Property Type (delete as appropriate) Commercial/Domestic

Zone ..... Detector Head ..... Location .....
(Smoke/Heat/Optical/Flame)

Comments: .....

.....

.....

.....

Name of Fire Officer ..... Contact No.	UFS Code:
Local Technical Fire Safety Office ..... Tel:	File No.
Unwanted Fire Signals Officer: Malcolm Brightman Tel: 01296 744643	

- All enquiries should be addressed to either the UFS officer or your local Technical Fire Safety Office (detailed above)
- You should take steps to investigate the cause of the alarm and if your working procedures have given rise to the alarm, they should be revised as appropriate.
- If the alarm system is at fault, you should arrange for your alarm engineer to examine the system and carry out any necessary remedial action. (Note - this work is to be carried out as your own expense).
- All information contained within this form will be treated in the strictest confidence and only used in accordance with the Data Protection Act 1998.

ACFO Des Williamson: Service Delivery
Buckinghamshire Fire and Rescue Service, Brigade Headquarters, Stocklake, Aylesbury, Bucks HP20 1BD
Tel: 01296 424666 Fax: 01296 744449

FIGURE 3: The unwanted fire signals form completed by BMKFA personnel

Starting with the initial investigation, Malcolm will complete a more thorough audit and work with the RP to resolve any issues. In most cases a letter of deficiencies is issued and sent to them with a timescale within which to resolve them.

Some of the most observed common causes for UWFS's and strategies implemented are reproduced in Table 7.

Observed cause of UWFS	Implemented action
Smoking under smoke detectors	Changed to heat detectors
Activating MCPs to call warden	MCP's removed and replaced with correctly located smoke detectors.
Contractors producing dust or paint fumes setting off smoke detectors.	Isolated the zone prior to works.
Dust settles on smoke detector cover during works and on removing the cover the dust is dispersed and activates the smoke alarm.	Educated contractors on the need to clean smoke detector covers some time prior to their removal
Cooking triggering smoke detectors	Specified the correct detection (heat detectors in kitchen). Also the use of extractor fans linked to ovens that come on automatically.
Hitting MCP button to open doors rather than exit button.	MCP covers used to prevent incorrect operation
MCPs maliciously activated	CCTV in entrances for security purposes deter malicious activations
Faulty detectors causing multiple alarms	Replaced detector head
Faulty chips on a batch of network monitoring hardware sending false signals to the ARC	Systems replaced
Activations from sprinkler systems (usually a drop in water pressure from an activated sprinkler causes a signal to be sent to the fire alarm system).	Sometimes rogue signals are transmitted. Any general purpose input to the panel which activates the alarm can be susceptible.
Smoke cloak activates smoke detectors and the fire brigade turn up instead of the police!	Replaced with heat detectors
MCPs in mental hospital being set off by patients as doors open.	All staff have a key to operate the MCPs
Heat detectors produce false alarms	De-rated the heat detector
Using toasters in offices and causing smoke alarms to go off	Toasters removed.
Smoke detectors installed in car garages.	Replaced with heat detectors
Smoke machines used in local village hall during function and smoke detector activated.	Guidance issued to owners to advise all users not to use smoke machines
Smoke detectors in lounge regularly going off, directly linked to ARC resulting in a callout every time.	Single point smoke detector for local early warning with a heat detector linked to the ARC.

TABLE 7: Most common UWFS causes and implemented actions in BMKFA

The following have also been observed:

- Very few false alarms from beam detectors and aspirating detectors and virtually none from flame detectors;
- Conventional alarm panels account for around 50-60% of those in the field and these cannot identify the device that alarmed if the system is reset;
- Generally domestic cooking causes the most false alarms in private dwellings.

Some proven solutions for reducing UWFSs that have been implemented by building owners are reproduced in Table 8.

Observation	Solution
The same UWFS being reported time and time again.	Having a process in place to ensure that the causes of every UWFS are picked up and that corrective actions are implemented.
Building wardens available 24-7 but ARC contacted automatically during an alarm.	If alarm activates then warden would check prior to ARC being notified.
Facilities with high turnover of staff and untrained persons dealing with UWFSs.	Proper procedures in place to train new staff.
Shopping centres where there is change in the type of shop and therefore no longer suitable fire detection system.	When there is a change of tenant* for a building advise the fire alarm maintenance company and update/upgrade the system.
Building owners and users ignorant of their fire detection systems	Advised users and building owners that they are connected to an ARC and an UWFS will result in a callout. Provided guidance on how to identify and report false alarms effectively.
Lack of communication within parts of organisation	Benefits of better communication within the organisation- fire safety manager should know which parts of the building are occupied or when contactors are coming in.
** A new tenant should produce a risk assessment under the Regulatory Reform (Fire Safety) Order 2005.*	

TABLE 8: Proven solutions for reducing UWFSs used by building owners

In the BMKFA report[10] outlining the prevention strategies for UWFSs the following guidance is provided for RPs/managers:

Consult with your fire alarm engineers to ensure the correct type of detection is installed in the most suitable location.

- Have detection and alarm systems regularly serviced.
- Ensure there are appropriate ‘call filtering’ measures in place such as a ‘Double Knock’ procedure, to enable safe investigation of alarm activations prior to summoning the Fire Service for assistance.
- Ensure Fire Marshalls are appointed and have received appropriate training.
- If your system is linked to a ‘Call monitoring’ centre make sure they are delivering the service you require.
- Ensure your out-of-hours key holder can respond to alarm activations speedily in order to meet with Fire Service crews and carry out post alarm procedures.

Malcolm notes the benefits of specialists in the FRS are that they can provide suitable fire safety management advice which building owners can’t be expected to know.

The use of the above strategies have led to a significant reduction in UWFSs over the years as shown in Figure 4 for domestic and commercial premises from 2004-2013. In 2005/6 the total numbers from domestic and commercial premises were 3308 and in 2012/13 were down to 1815. It has been estimated that the associated annual savings for BMKFA are in the region of around £450k per year[3].

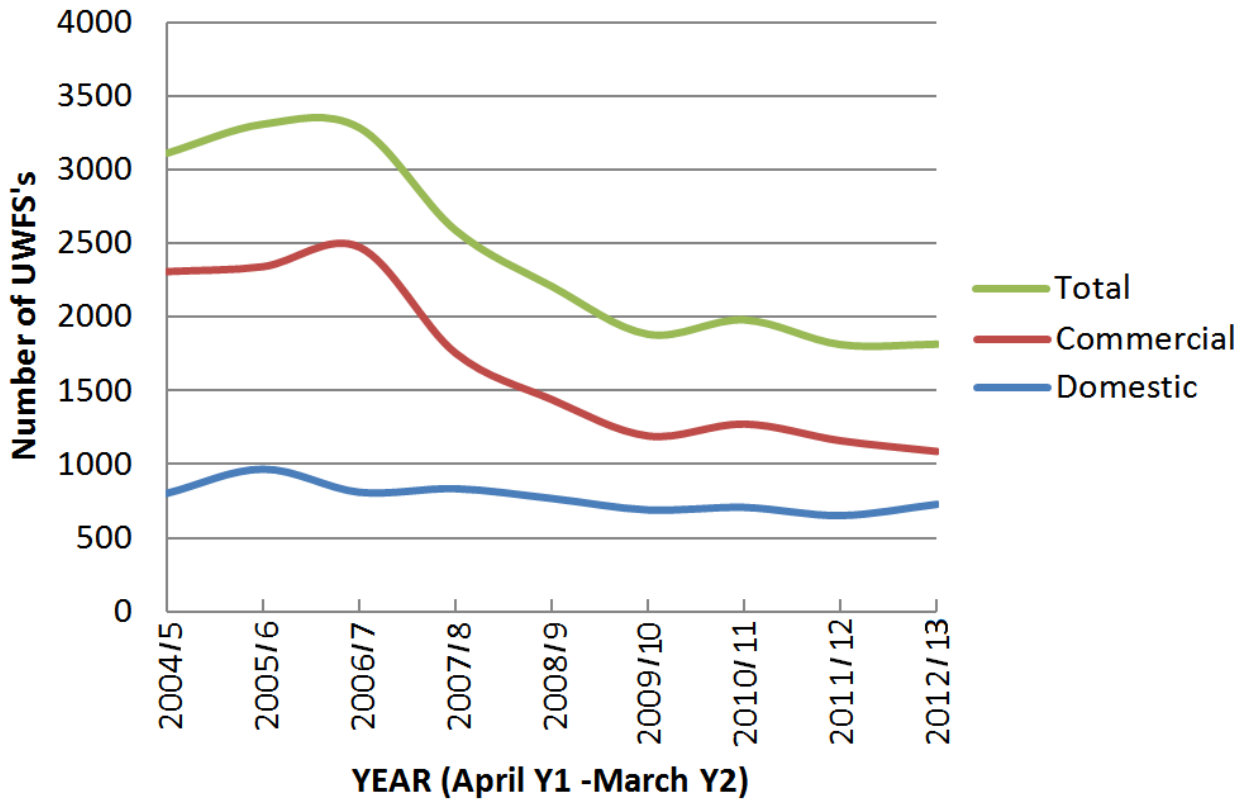

FIGURE 4: The UWFS trends for BMKFA from premises from 2004-2013

The number of domestic premises that produce UWFS for BMKFA cannot be reduced by the same methods that are applicable to non-domestic premises: mainly because there is no enforcement. In respect of domestic premises, there is also an absence of umbrella organisations that seek to provide a uniform approach to the matter of UWFS. Therefore domestic premises remain a challenge (as can be seen by the only slight negative gradient for domestic premises in Figure 4).

It has been noted that generally domestic cooking causes the most false alarms in private dwellings and so it is worth considering methods to educate owners of domestic premises on how to reduce false alarms. In the domestic environment this is most likely to be achieved by installing appropriate detectors in and around kitchens.

4.7 Discussion

From the review of the IRS data it has been identified that the terms given in BS 5839-1 to classify the types of UWFSs differs from that used in the IRS database. It would be beneficial if these two methods were more closely aligned.

During the work it has been identified that the real cause of a UWFS is not identified consistently or accurately within the IRS which means that the recorded data is open to misinterpretation. The IRS provides general statistical data not concise causes of false alarms, the Fire Officer is limited to use one of 53 causes and if they can't find one that is appropriate then they will use the one that is closest. As there is no comprehensive data detailing the real causes of false alarms in the UK it is not possible to propose alternative causes which would cover the majority of false alarm instances observed.

A revised IRS that correctly identifies and, without loss of core information, classifies the event appropriately would provide the necessary data to gain a better understanding of the causes of false alarms. Any major revisions to the IRS are unlikely to take place due to the sheer volume of work that would be required which would include, gathering sufficient data to identify the common false alarm causes, proposing suitable alternative causes and structuring them in a useable format. It may be useful simply to have the additional question in the IRS, "What intervention may have prevented the UWFS?" with a list from which one result can be selected. If FRS's appoint an UWFS officer then a separate record of what interventions were taken would also provide very useful information.

From the discussions with Malcolm Brightman it has been identified that the approaches needed to effectively reduce UWFSs are on many levels and include a number of key physical interventions as well as educating building owners and RPs. The estimated savings of around £450k/year to BMFKA confirm that the strategies used by BMKFA are the most direct and effective means for reducing UWFSs and maintaining them at a low level.

BMKFA have reduced the number of false alarms by 45% over 7 years (from 3308 in 2005 to 1815 in 2012). If the same methods used by Malcolm could be used to reduce the false alarms by the same proportion for all other FRS's in the UK this could save £42.1m per year. This is based on 312,000 (total UK false alarms 2012[2]) x 0.45 (45% reduction) x £300 per false alarm (estimate). Furthermore, as false alarms cost around £1bn per year in UK to businesses and FRS's[1] then the same reduction could save UK businesses ~£408m per year (£450m-£42.1m).

It is clear that a technical and experienced unwanted fire signals officer dedicated to investigating UWFSs and collaborating with the RP is a very effective means for FRS's to reduce UWFSs and keep them low as new buildings come "on-line". There is anecdotal evidence from Europe to suggest that where fire authorities charge for callouts, users of the building might purposefully start up fires, for example, in a bin, to avoid the charges when they have accidentally triggered the fire alarm system.

The following observations were also made for causes of UWFSs:

- The general purpose input to some panels that triggers the fire alarm system can cause UWFSs due to faulty operation of the equipment it is connected to;
- Smoke cloaks used for security purposes and smoke machines when used in public halls can set off smoke detectors;
- Smoke detectors commonly installed in car garages cause UWFSs;
- Misuse of spaces e.g. using toasters in offices that contain smoke alarms;
- Conventional panels, once reset, do not identify devices that cause false alarms.

A noteworthy strategy is that smoke detectors connected to ARCs can be replaced with a single point (domestic) smoke detector, for local early warning, combined with a heat detector linked to the ARC. This has been proven to reduce UWFSs without compromising the safety of users.

Cooking causes the most false alarms in private dwellings therefore the most direct method to address this is by educating owners of domestic premises on the appropriate use of detection in the home.

5 Conclusion and recommendations

The purpose of this project was to collate information about the causes of false alarms observed in buildings and to identify approaches that could be developed and used to reduce their occurrence. It was also intended to identify whether changes in standards and codes of practice could lead to a reduction in false alarm occurrence.

Identifying potential contributors and obtaining false alarm data proved to be a difficult exercise which suggests that gathering this kind of data is not something that either FRS's or others perform as a routine exercise. However, two different contributors were identified- KCL and BMKFA and they provided very different data that reported similar causes of false alarms in the field.

KCL provided data from 699 false alarm incidents and following a thorough review were reduced to 432 valid false alarms for which 6 physical interventions were identified that could be effective in reducing false alarms. These are detailed below starting with the one which would potentially resolve the most first:

- Replace detector with multisensor (69.2%)
- Use of appropriate approved detector/s located correctly (43.5%)
- Use of protective covers over approved MCPs with adequate signage and CCTV where required (16.7%)
- Use of EN 54-2 approved analogue addressable panel (10.2%)
- Better control of contractors (9.7%)
- More rigorous maintenance of the system (6.0%)

Of the solutions proposed replacement with a multisensor is perhaps the most simple, direct and effective method. The cost for a standard optical/heat multisensor are reported to be between £5 and £10 more than a standard optical detector which would make it a cost effective solution to replace problem detectors or in areas where false alarm risks are higher. The estimated costs to businesses are ~£2.9k per false alarm (see section 3.4).

The data supplied by KCL provides a snapshot of the types of false alarms that are observed in a wide variety of commercial and residential buildings. In order to quantify the effectiveness of the proposed solutions these would really need to be implemented in the field and monitored over a period of time. There is no way to know whether the false alarm causes identified are representative of the UK but it does give valuable information of what might be the most common causes in the UK. Identifying other sources and gathering more data from independent organisations across the UK like Kings College London would provide more representative data.

The use of pre-alarm states during which an investigation is conducted has also proven to reduce false alarms at KCL.

Discussions with BMKFA and analysis of their UWFS trends revealed that the use of an experienced and technical unwanted fire signals officer dedicated to investigating UWFSs and working with RPs is the most effective means to reduce UWFSs and keep them low as new buildings come "on-line". With cost savings of £42.1m/year estimated for FRS's and £408m to UK businesses.

In order to validate whether the observations of BMKFA are representative of those across the UK more anecdotal accounts or actual data from further ex- or current UWFS officers would be required. Reducing the number of false alarms from domestic premises remains a challenge even though the vast majority are reportedly related to cooking incidents. Educating homeowners on effective installation and use of detectors in and around kitchens is likely to lead to the greatest reduction in false alarms from the domestic environment.

The key advice given by LFB and BMKFA recommends that for commercial buildings:

- somebody is responsible for the fire alarm system and knows what to do;
- fire alarm systems are regularly checked;
- ensure the correct detection is in place and is located in the most suitable location;
- where practical investigate false alarms before calling for help;
- false alarms are followed up and action taken to prevent reoccurrence.

The following strategies have proven to reduce false alarms:

- De-rating problem heat detectors;
- Use of domestic point smoke detector for local warning with a heat detector linked to the ARC;
- Isolating zones prior to construction works & cleaning smoke detector covers prior to their removal;
- Having processes in place to ensure that the cause of every UWFS is picked up and measures introduced to prevent re-occurrence;
- In premises with high staff turnover (e.g. hospitals) ensuring that there are proper procedures in place to train new staff on how to deal with UWFSs;
- When there is a change of usage for a building advise the fire alarm maintenance company;
- Educating users and RPs that they are connected to an ARC and an UWFS will result in a callout;
- Providing users and RPs with guidance on how to identify & report false alarms effectively;
- Encouraging greater communication within an organisation e.g. fire safety manager should know when contactors are coming in.

It has also been identified that the terms given in BS 5839-1, used by RPs to classify the types of false alarms, differs from those used in the IRS database and it is recommended that these are more closely aligned. It was also identified that the data obtained from the IRS does not contain enough detailed information and so the real causes of false alarms are not accurately classified.

As can be seen, there are many ways that false alarms can be reduced often using simple methods. It has been identified that changes in standards or codes of practice are not necessary as the technology already exists and the codes provide adequate guidance. However educating building owners, RPs and the general public could contribute significantly to reducing false alarms. Also the increased use of multi-sensor detectors may avert false alarms from common causes such as cooking fumes, steam etc.

Analysis of the data that was gathered for this research project has provided very useful information on how to reduce false alarms. In order to further understand the real causes of false alarms the use of a technically competent false alarm investigator would be needed. The investigator would need to be immediately available to attend any premises whilst false alarms were in progress or soon after one has occurred. Such an approach would ensure rapid investigation of the false alarm increasing the likelihood of accurate diagnosis of the cause. Sufficient statistical data could be gathered to more accurately identify the causes of false alarms and ultimately provide further guidance to reduce them.

6 References

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7 Acknowledgements

The author would like to thank Suzanne Whitehead, Stephen Mackenzie and Diana Sebastian for collating and supplying the data used in section 3 and for being so helpful.

The author would also like to thank Malcolm Brightman and Chris Bailey for providing the data used in section 4 and for Malcolm's knowledge and willingness to contribute and share his experience.

Appendix A Proposed resolutions for KCL false alarms 2010-13

The 6 solutions proposed to resolve the 110 activation categories are detailed below:

- Solution 1: replace detector with multisensor
- Solution 2: use of appropriate approved detector/s located correctly
- Solution 3: use of protective covers over approved MCPs with adequate signage and CCTV where required
- Solution 4: use of EN 54-2 approved analogue addressable panel
- Solution 5: better control of contractors
- Solution 6: more rigorous maintenance of the system

The table below shows the effectiveness of each solution for all of the identified activation categories. Each solution has been scored on whether it would most likely resolve the observed false alarm. For example the case of "General dust from building works" could be addressed through Solution 1: replace detector with multisensor or Solution 5: better control of contractors and so both solutions score 25. The effectiveness of every solution is then given at the bottom (in %) by Sum of all scores / Sum of all potential scores (432).

		Solution number					
Activation category	**Occurrence**	**1**	**2**	**3**	**4**	**5**	**6**
MCP accidentally triggered	**27**			27			
General dust from building works	**25**	25				25	
Old detector	**21**	21	21				
Burnt toast activating local smoke detector	**20**	20	20				
Faulty detector head	**19**	19	19				
MCP malicious activation	**17**			17			
Unidentified equipment faults	**17**				17		
Water leaks- corruption in loop	**16**				16		
MCP mistaken for door release button	**12**			12			
Smoke from cooking (hob)	**11**	11	11				
Dust in smoke detector	**10**	10					10
Steam from shower	**10**	10	10				
Maintenance of fire detection/suppression system	**9**						9
Panel fault caused alarm	**9**				9		
Smoke from cooking oil	**8**	8	8				
Smoke from cooking (microwave)	**7**	7	7				
Overcooking	**7**	7	7				
Suspected dust triggering smoke detector	**7**	7				7	
Unattended food in microwave	**7**	7	7				
Kettle triggering smoke detector	**6**	6	6				
Hot tap left on triggering smoke detector	**5**	5	5				
Nest of spiders/bugs in detector head	**5**	5					5
Smoke machine	**5**	5	5				
Steam from kitchen appliance	**5**	5	5				
Unattended food on hob	**5**	5	5				
Burnt food activating corridor detector	**4**	4	4				
Convection heaters cause heat detectors to operate	**4**	4	4				

Smoke from cooking (oven)	**4**	4	4				
Steam from dish washer set off smoke detector	**4**	4	4				
Water leaks- setting off detector	**4**	4	4				
Activation due to hairspray	**3**	3					
Building works producing smoke	**3**	3				3	
Hair straighteners/dryers	**3**	3					
Heat detector activated by heat from boiler room	**3**	3	3				
MCP causing false alarm	**3**			3			
New convector heater triggered smoke detector	**3**	3					
Oven opened early allowing smoke/steam	**3**	3	3				
Overheating oil from wok	**3**	3	3				
Smoke from toaster and extraction disabled	**3**	3	3				
Steam from leaking radiator	**3**	3	3				
Activation due to deodorant	**2**	2					
Chemical reaction	**2**	2					
Cleaner dusting	**2**	2					
Condensation	**2**	2					
Dust from outside triggering smoke detector	**2**	2					
Failed ballast/Capacitor in light fitting	**2**	2					
Incorrect detector	**2**	2	2				
Lightning strike or thunder storms causing vibration	**2**		2				
Malicious powdered extinguisher activated	**2**	2					
MCP coming off wall	**2**			2			
MCP faulty	**2**			2			
Oil fumes leaked from a pressurised equipment	**2**	2					
Person stuck in lift pressed break glass on MCP	**2**			2			
Student using hair dryer	**2**	2					
Suspected insect- Sensor activated several times	**2**	2					2
Temporary lighting below heat detector	**2**	2					
Toaster used in bedroom	**2**	2					
Unattended food in grill	**2**	2	2				
Unknown purpose/accidental activation of MCP	**2**			2			
Welder setting off heat detector	**2**	2				2	
Works in un-isolated zone	**2**					2	
Drying nail-polish under heat detector	**2**	2					
Activation due to air-freshener	**1**	1					
Activation due to fly-spray	**1**	1					
AHU Fan burnt out & set off alarm	**1**	1					
Autoclave opened and steam activated heat detector	**1**	1					
Autoclave opened and steam activated smoke detector	**1**	1					
Bomb threat caused fire alarm activation	**1**	Not resolvable					
Carpets cleaned in poorly ventilated area	**1**	1					
Chimney testing set off smoke alarm	**1**	1				1	
Cold in cold room	**1**		1				
Condensed water on heating pipes triggers heat alarm	**1**	1					
Dishwasher	**1**	1	1				
Extraction system powered up causes smoke detector to go off	**1**	1					

Report Ends

Fan burnt out	**1**	1					
Faulty kettle produced lots of steam	**1**	1					
Following MCP weekly test device would not reset	**1**			1			
Heat detector triggered by heat from generator	**1**	1					
Human error- Wrong loop isolated during weekly sprinkler test	**1**					1	
Incense being burned in room	**1**	1					
Kettle used in bedroom	**1**	1					
Lift motor producing smoke	**1**	1					
MCP broken by potential thief	**1**			1			
New smoke detector installed too close to microwave	**1**	1	1				
Plastic incense holder left unattended	**1**	1					
Poor siting of MCP- knocked when door opens	**1**			1			
Power surge causing panel to activate	**1**				1		
Signs of smoking in room	**1**	1					
Small black flies getting into the smoke detector	**1**	1					
Smoke detector head not covered by contractors	**1**	1				1	
Smoke detector went off due to cold	**1**	1	1				
Smoke detectors activated by dust from roof	**1**	1					
Smoke from faulty light fitting	**1**	1					
Smoke head knocked off	**1**		1				
Smoking in toilet	**1**	1					
Soldering	**1**	1					
Somebody inquisitively investigating MCP	**1**			1			
Spilling of oil on hob caused smoke	**1**	1	1				
Spraying equipment	**1**	1					
Steam from adjacent café kitchen	**1**	1	1				
Steam from boiler triggering heat detector	**1**	1	1				
Steam iron set off smoke detector	**1**	1					
Student spraying deodorant & set off alarm	**1**	1					
Student using straighteners	**1**	1					
Suspected faulty smoke detector	**1**	1	1				
Suspected small steam leakage	**1**	1					
Tampering with MCP	**1**			1			
Unattended food in oven	**1**	1	1				
Hot water tap, hotter than usual steam set off smoke detector	**1**	1	1				
Water getting into the panel- false activation	**1**				1		
TOTAL	**432**	299	188	72	44	42	26
POSSIBLE % REDUCTION IN FALSE ALARMS	**-**	69.2	43.5	16.7	10.2	9.7	6.0

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